

CLAIMS

1. An optical communication system comprising:
a transmitting station transmitting one or more optical beams through free space;
a receiving station receiving at least one of the one or more optical beams and
quantifying a parameter for each of the one or more optical beams; and
a wireless feedback link sending information associated with the quantified
parameter for each one of the one or more optical beams to the
transmitting station, and in response thereto, the transmitting station using
the information to adjust at least one of the one or more optical beams.
2. The system of claim 1, wherein the wireless feedback link further comprises a
feedback receiver located at the transmitting station and a feedback transmitter
located at the receiving station, the feedback transmitter transmitting the
information to the feedback receiver.
3. The system of claim 2, wherein the one or more optical beams comprise one or
more uniquely tagged optical beams.
4. The system of claim 3, wherein the transmitting station further comprises:
an oscillator emitting an optical signal;
a Nx1 splitter receiving the optical signal and splitting the optical signal into the
one or more optical beams;
a plurality of optical phase modulators, each optical phase modulator receiving
one optical beam in the one or more optical beams and uniquely tagging
the one optical beam, thereby providing the one or more uniquely tagged
optical beams; and
phase control electronics receiving the information from the feedback receiver,
and processing the information to adjust the optical phase modulator
which tagged the one uniquely tagged optical beam.

5. The system of claim 4, wherein the transmitting station further comprises an optical fiber array, each optical fiber in the array receiving at least one uniquely tagged optical beam from the plurality of optical phase modulators, and emitting the at least one uniquely tagged optical beam into free space from an aperture.
6. The system of claim 3, wherein the parameter is the power of at least one of the one or more uniquely tagged optical beams.
7. The system of claim 1, wherein the wireless feedback link is a RF link or a low-bandwidth optical link.
8. The system of claim 5, wherein the Nx1 splitter, the plurality of optical phase modulators, and the optical fiber array all comprise optical fiber components and optical fibers are used to couple the components.
9. The system of claim 4, wherein the plurality of optical phase modulators comprise pump diodes.
10. A method of compensating for phase fluctuations comprising:
applying a tag to one or more optical beams in a transmitting station;
transmitting the one or more uniquely tagged optical beams through free space
from the transmitting station;
receiving the one or more uniquely tagged optical beams at a receiving station;
quantifying a parameter associated with each one of the one or more uniquely
tagged optical beams;
sending information associated with the quantified parameter for each one of the
one or more uniquely tagged optical beams to the transmitting station over
a wireless feedback link; and
adjusting at least one of the one or more uniquely tagged optical beams based on
the information.

11. The method of claim 10, wherein adjusting at least one of the one or more uniquely tagged optical beams comprises adjusting the phase of the at least one uniquely tagged optical beam.
12. The method of claim 10, wherein applying a tag comprises amplitude modulating at least one of the one or more optical beams with a specified carrier frequency.
13. An adaptive optical system compensating for phase fluctuations comprising:
 - an optical fiber array located at a transmitting station, the optical fiber array emitting one or more uniquely tagged optical beams into free space from an aperture;
 - a receiving station receiving the one or more uniquely tagged optical beams and quantifying a parameter for each uniquely tagged optical beam of the one or more uniquely tagged optical beams; and
 - a wireless feedback link sending information associated with the quantified parameter for each uniquely tagged optical beam to the transmitting station, and in response thereto, the transmitting station using the information to adjust at least one uniquely tagged optical beam to compensate for phase fluctuations.
14. The system of claim 13, wherein the wireless feedback link further comprises a feedback receiver located at the transmitting station and a feedback transmitter located at the receiving station, the feedback transmitter transmitting the information to the feedback receiver.
15. The system of claim 14, wherein the transmitting station further comprises:
 - an oscillator emitting an optical signal;
 - a Nx1 splitter receiving the optical signal and splitting the optical signal into one or more optical beams;
 - one or more optical phase modulators providing the one or more uniquely tagged optical beams to the optical fiber array, wherein each optical phase

modulator receives one optical beam of the one or more optical beams and uniquely tags the one optical beam; and
phase control electronics receiving the information from the feedback receiver, and processing the information to adjust the optical phase modulator which tagged the at least one uniquely tagged optical beam.

16. The system of claim 13, wherein the parameter is the power of the uniquely tagged optical beam.
17. The system of claim 13, wherein the wireless feedback link is a RF link or a low-bandwidth optical link.
18. The system of claim 15, wherein the optical phase modulators comprise pump diodes.
19. An optical communication system comprising:
means for applying a tag to one or more optical beams in a transmitting station;
means for transmitting the one or more uniquely tagged optical beams through
free space from the transmitting station;
means for receiving the one or more uniquely tagged optical beams at a receiving station;
means for quantifying a parameter associated with each one of the one or more uniquely tagged optical beams;
means for sending information associated with the quantified parameter for each one of the one or more uniquely tagged optical beams to the transmitting station over a wireless feedback link; and
means for adjusting at least one of the one or more uniquely tagged optical beams based on the information.

20. The system of claim 19, wherein said means for applying a tag comprises means for amplitude modulating at least one of the one or more optical beams with a specified carrier frequency.